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TECHNICAL STANDARDS AND SPECIFICATIONS MANUAL FOR THE RURAL GAS PROGRAM

Design, Construction, and Operation of Natural Gas Distribution Systems

Alberta
UTILITIES AND TELEPHONES

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PART A

GENERAL

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FOREWORD

The Technical Standards and Specifications Manual for the Rural Gas Program is issued by the Chief Officer of the Department of Utilities and Telephones of the Province of Alberta under the authority of section 3(f) of the Rural Gas Regulation, being Alberta Regulation 263/82 and amendments thereto, and shall be considered as forming a part of and having the same force and effect as that Regulation.

All enquiries respecting the provisions of this manual shall be directed to:

Manager, Construction and Operations
Gas Distribution Branch
Gas Utilities Division
Department of Utilities and Telephones
6th Floor, Westcor Building
12323 Stony Plain Road
EDMONTON, Alberta
T5N 3Y9

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1. Scope and Application

1.1 This manual applies to any natural gas distribution system installed as part of any rural gas utility (as defined in the Rural Gas Act), including any transmission or distribution pipeline, plant, appurtanence, equipment, and component forming part of that system.

1.2 All owners and operators of a rural gas utility (hereinafter referred to as "distributors"), and all employees or agents of a distributor who are involved in the design, project management, construction system, shall take account of the standards and specifications contained herein.

2. References

2.1 A person utilizing this manual shall give due consideration to the following legislation, codes, and standards, including any amendments thereto, in the design, construction, and operation of a distribution system.

2.2 The following legislation of the Province of Alberta:

2.2.1 Pipeline Act.

2.2.2 Pipeline Regulations of the Energy Resources Conservation Board.

2.2.3 Boilers and Pressure Vessels Act.

2.2.4 Gas Protection Act.

2.2.5 Gas Protection Regulations of the Department of Labour.

2.2.6 Clean Air Act.

2.2.7 Forest and Prairie Protection Act.

2.2.8 Forests Act.

2.2.9 Land Surface Conservation and Reclamation Act.

2.2.10 Oil and Gas Conservation Act.

2.2.11 Occupational Health and Safety Act.

2.2.12 Workers' Compensation Act.

2.2.13 Surveys Act.

2.2.14 Rural Gas Act.

2.2.15 Rural Gas Regulations of the Department of Utilities and Telephones

2.3 The following legislation of the Government of Canada.

2.3.1 Navigable Waters Protection Act.

2.3.2 Explosives Act.

2.3.3. Gas Inspection Act.

2.4 The following Canadian Standards Association codes:

2.4.1 Z184-M1979: Gas Pipeline Systems.

2.4.2 Z169-M1978: Aluminum Pipe and Pressure Piping Systems.

2.4.3 Z245.1-M1979: General Requirements for Plain Ended Welded and Seamless Steel Line Pipe.

2.4.4 Z245.3-M1979: Low Strength, Steel Line Pipe Smaller than 457 mm in Diameter.

2.4.5 B137.0: Definitions, General Requirements, and Methods of Testing for Thermoplastic Piping.

2.4.5 B137.4-M1977: Polyethylene Piping Systems for Gas Service.

and all other related legislation and codes applicable to distribution system design, construction, and operations.

PART B
DESIGN AND
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1. Consumer Load Surveys

1.1 A consumer load survey shall be undertaken by a distributor or its agent in order that the design of a distribution system may predict the peak hour design volumes which that system is required to transport.

1.2 Notwithstanding subsection 1.1, the Department may waive the requirement for a consumer load survey where it is satisfied that such a survey would not necessarily improve the data already available to the designer of a distributiuon system.

1.3 Where a consumer load survey is required pursuant to this section, a distributor or its agent shall accurately record the consumer's energy requirements on a Load Survey Form. Distributors need not necessarily use the form as shown in Appendix 1, but any other form used by a distributor for consumer load survey purposes shall contain at least the minimum data requirements of that form.

2. Peak Hour Design Loads

2.1 Peak hour design loads for use in the design of a distribution system or any portion thereof shall be derived from a consumer load survey conducted under the provisions of section 1.

2.2 The derivation of peak hour design loads shall be based on an engineering analysis of each consumer's maximum energy requirements and the coincidence aspect of gas fired equipment utilization.

2.3 An engineering analysis conducted under the provisions of subsection 2.2 shall take account of the following utilization features of gas-fired equipment:

2.3.1 For distribution systems designed to transport gas for space heating and for domestic appliances, an appropriate coincidence factor shall be applied to the aggregated total energy requirements of consumers to be served by that distribution system in recognition of:

(a) the frequency of appliance use and peak demand;

(b) the effect of ambient temperatures on maximum space heating demand;

(c) the variation in the value of coincidence factors in proportion to the number of consumers.

2.3.2 For distribution systems designed to transport gas for space heating, domestic appliances, and also for special applications such as grain drying or irrigation, peak hour design volumes shall comprise of either:

(a) the maximum load demand during low ambient temperature conditions as derived from the provisions of subsection 2.3.1, or

(b) the aggregate of the maximum load demand for the special application and a reduced load demand for space heating and domestic appliances as derived by application of an appropriate coincidence factor.

2.3.3 For primary service lines, the peak hour volume shall equal the maximum hourly demand as derived from a consumer load survey or as estimated by the designer under the provisions of section 1 where a consumer load survey is not required.

2.4 Where natural gas is required for special applications such as grain drying or irrigation, peak hour design loads shall be derived while taking into account the specific utilization features of this special application including:

2.4.1 The compatibility of burner rating and bin capacity in grain dryers;

2.4.2 The variation in burner utilization between continuous and batch-type grain dryers;

2.4.3 The compatibility of maximum engine power generation and pump power intake in irrigation units.

3. Sizing and General Design of Distribution Systems

3.1 All gas flow formulae utilized in the design of any pipeline within a rural gas utility may be subject to approval by the Department.

3.2 A person engaged in the design of any pipeline within a rural gas utility shall utilize gas flow formulae which are dependent on the Reynolds Number for prediction of flow conditions within that pipeline.

3.3 The peak hour design load to be used in the design of a distribution system shall be based on a realistic projection of ultimate peak hour demand by taking into account reasonable projected growth in load demand for the area to be served by the

distribution system. Growth in load demand may be considered reasonable where it is based on the following projections:

3.3.1 An increase in the number of potential domestic consumers who may apply for gas service, notwithstanding previous refusals by those consumers;

3.3.2 An increase in the use of natural gas for special farm applications such as grain drying or irrigation;

3.3.3 An increase in subdivision development within the area to be served by the system.

3.4 Notwithstanding subsection 3.3, the Department may:

3.4.1 Require that a designer substantiate the projected growth in load demand, or

3.4.2 Require that the designer disregard a specific portion of the projected growth in load demand for economic reasons.

3.5 Where actual growth in load demand justifies the need to upgrade a distribution system respecting its deliverability, a designer shall take account of the following considerations:

3.5.1 Interconnection of pipelines at strategic locations may be of more practical and economic benefit than system looping.

3.5.2 The location of loops in a system should be strategically selected to create maximum impact at minimum cost. In this regard, alternatives should, where applicable, be considered for the more conventional concepts of:

(a) commencing the loop at the point of supply for the system to be looped, and/or

(b) locating the loop at the segment of highest velocity and/or pressure drop per unit length.

3.5.3 Where a pipeline which is to be looped crosses an obstacle or number of obstacles such as creeks, rivers, highways, or railway lines, looping of that specific obstacle should only be considered where:

(a) the loop line will be located at a significant distance from the existing pipeline, thus outweighing any economic or practical benefits of connecting the loop line to the existing pipeline at either side of the obstacle, or

(b) the existing crossing of the obstacle is in a deteriorating condition and/or its size would have a serious effect on flow conditions in the upgraded system.

4. Design, Specification, and Selection of Equipment and Materials

4.1 All equipment and materials which are intended for use in a rural gas utility shall comply in all respects with the individual or combined requirements of all legislation, standards, and codes issued by:

4.1.1 The Canadian Standards Association

4.1.2 The Energy Resources Conservation Board

4.1.3 The Department of Labour

4.1.4 Any other regulatory authority having overriding jursidiction over the design, specification, manufacture, testing, quality control, and installation of any equipment or materials to be used in a rural gas utility.

4.2 All meters to be used for the measurement of the volume of gas to be sold to a consumer in a rural gas utility, and all associated controls and devices which are designed to accurately correct that volume to Standard Reference Conditions, shall comply in all respects with the requirements of the Department of Consumer and Corporate Affairs of the Government of Canada.

4.3 All equipment and materials which are intended for use in a rural gas utility shall be designed, specified, and selected on the basis of the following criteria:

4.3.1 Safety of installation and operation.

4.3.2 Efficiency of operation.

4.3.3 Initial capital cost of construction.

4.3.4 Operating and maintenance costs.

4.3.5 Availability of spare and replacement parts during the anticipated operating life of the equipment or materials.

4.3.6 The physical and chemical properties of the natural gas which is to be transmitted through the equipment and materials.

4.3.7 Where applicable, the atmospheric conditions under which the equipment and materials will operate.

4.3.8 The frequency, extent, and type of servicing which will be provided by the distributor.

4.3.9 The specific utilization features of the distribution system in which the equipment or materials is to be installed including the var-

iation in pressure and volume flow demand between initial minimum and ultimate maximum consumer requirements, or due to the seasonal variation of consumer requirements.

4.4 Installation of "POP" type relief valves, which may be identified by the simple spring and seat mechanism in a valve body cast in a similar shape to that of a pipe union, is not permitted in any part of a rural gas utility.

4.5 Tracer wire manufactured from 16 gauge solid core copper wire with an extruded polyethylene coating, or other such specification which has received the prior approval of the Department, shall be installed simultaneously with all polyethylene pipelines installed in a rural gas utility.

4.6 Above ground connectors for tracer wire shall be of the type specifically designed and manufactured to provide insulated electrical continuity for the tracer wire.

4.7 The number and type, if any, of block valve stations in a distribution system for pipeline isolation purposes shall be based on the following considerations:

4.7.1 The terrain conditions through which the pipeline will be installed, and/or any major obstacles which the pipeline will cross.

4.7.2 The number and type of consumers to be supplied from the pipeline.

4.8 In selecting the principal operating components of a regulator station, and designing the layout of those components within the station, a designer shall take into account the following considerations:

4.8.1 The quantity and quality of gas in regards to the type of regulator and ancillary equipment and the number of pressure cut stages;

4.8.2. The number and type of consumers to be supplied by the station in regards to the use of parallel independently-operated regulator runs.

4.9 The installation of above-ground facilities such as intermediate pressure regulator stations and block valve stations shall take into account the following considerations:

4.9.1 Location shall be adjacent to suitable access for year round maintenance and operation, and shall be on a high point of the pipeline and the terrain through which the pipeline is to be installed.

4.9.2 Each station shall be provided with:

(a) adequate structural support to prevent excessive stress on station and inlet/outlet piping;

(b) where applicable, a protective railing or fence to prevent damage from farm machinery;

(c) security measures to prevent unauthorized operation of valves and other equipment;

(d) where applicable, a suitable protective housing to prevent malfunction of control devices due to inclement weather conditions and to prevent accelerated corrosion of such devices.

5. Routing of Pipeline Systems

5.1 The designer of any pipeline in a rural gas utility shall design the routing of that pipeline based on the following criteria:

5.1.1 The requirements of any Government body, or any regulatory authority, having jurisdiction over the land, waterway, railway, or roadway affected by the location of pipelines on or adjacent to that property.

5.1.2 The requirements of any landowner whose property will be directly or indirectly affected by the location of pipelines on or adjacent to that property.

5.1.3 The requirements of any owner of a utility line whose pipeline or cable is to be traversed by a distributor's pipelines. In addition, the designer shall take account of the effect of adjacent overhead power lines on a steel or aluminum pipeline which is to be located adjacent to that power line.

5.1.4 Any proposal to amend the current use of the land in which it is proposed to locate pipelines.

5.1.5 The sub-surface condition of the land in which it is proposed to locate pipelines. Where it is feasible to do so, location of pipelines in land with sub-surface rock, in either solid or loose formation, shall be avoided.

5.1.6 The surface terrain condition of the land in which it is proposed to install pipelines. Where it is feasible to do so, location of pipelines in swamp, muskeg, or bodies of water, or in land which is covered by timber or dense brush, shall be avoided.

5.1.7 The possibility of soil erosion or removal. Where necessary, a qualified geotechnical study shall be conducted to assist the designer in establishing effective methods of controlling severe instances of potential soil erosion which could adversely affect the operation of pipelines.

5.1.8 The location of all suitable gas sources in relation to the proximity of the majority of con-

sumers to be served from the pipeline system supplied from the gas source.

5.1.9 The ease of access which the location of pipelines may provide for initial construction and for subsequent inspection, maintenance and repair of pipelines. Where it is feasible and within economic reason to do so, pipelines shall be located by a "grid system" based on the following principles:

(a) location in an east-west or north-south direction;

(b) location at established parallel distances from east-west or north-south roads and fence lines;

(c) changes of direction at right angles.

5.2 In addition to all of the technical criteria for routing of pipelines as outlined in subsection 5.1, the designer shall also consider the economic aspects of all alternative routes which may be available.

6. Cathodic Protection

6.1 All pipelines, plant, and appurtenances in a rural gas utility which are subject to accelerated corrosion due to electrochemical conditions shall be adequately protected from such corrosion.

6.2 Cathodic protection systems installed in a rural gas utility under the requirements of subsection 6.1 shall be designed and installed by a person knowledgeable in that field of expertise.

6.3 Notwithstanding subsection 6.2, a distributor or its agent may install a cathodic protection system if:

(a) the cathodic protection system is based on the sacrificial anode principle;

(b) the selection of the type of sacrificial anode is based on consideration of the electrochemical conditions resulting from the combination of actual pipe material and soil conditions;

(c) the cathodic protection system is designed and manufactured by a person knowledgeable in that field of expertise;

(d) the Department has approved such installation by the distributor or its agent.

6.4 All metallic pipelines shall be cleaned and coated with a suitable protective coating which is specifically manufactured for that purpose and bonded to the pipeline by recognized methods.

6.5 Where connection of dissimilar materials occurs in a pipeline system, or where it is necessary to electrically isolate individual sections of a pipeline and cathodic protection system, such connections or isolation points shall be made with suitable isolation fittings or flanges specifically designed and manufactured for that purpose.

6.6 Installation of a cathodic protection system in a rural gas utility shall be simultaneous with the installation of the pipeline system to be protected by that cathodic protection system, except in circumstances where it is necessary or advisable to allow adequate settlement of trench backfill prior to the measurement or pipe-to-soil electrical potential.

7. Project Management

7.1 A distributor shall provide suitable project management for construction of a pipeline in a rural gas utility.

7.2 Project management provided by a distributor or its agent pursuant to the requirement of subsection 7.1 shall be designed to achieve the following controls for construction of a pipeline in a rural gas utility:

7.2.1 That the planning, coordination, and implementation of a construction project is carried out in an efficient manner and in accordance with the requirements of:

(a) the distributor;

(b) any landowner affected by the construction project;

(c) any regulatory agency having jurisdiction over any aspect of the construction project;

(d) the Department.

7.2.2 That the necessary permits and approvals are obtained from any person or regulatory agency which requires that such permits and approvals be obtained prior to commencement of the construction project.

7.2.3 That any specific requirements of any person or regulatory agency which has issued a permit or approval pursuant to subsection 7.2.2 are complied with in all respects throughout the duration of the construction project.

7.2.4 That any specific requirements of any person or any agency which has provided a utility right-of-way for the construction project are complied with in all respects.

7.2.5 That construction of the project is carried out in accordance with all applicable design plans, contract documents, and crossing agreements.

7.2.6 That damage to land and property is minimized as far as is practical and that all such

damage is recorded fully and subsequently repaired to the satisfaction of the owner of that land or property, provided that claims and/or demands by any owner of land or property are, in the distributor's judgement, fair and reasonable.

7.2.7 That suitable procedures are used for crossing of other pipelines and cables, and that the specified requirements of the owners of such pipelines and cables are complied with in all respects.

7.2.8 That suitable quality assurance procedures are developed and implemented for the handling, storage, and installation of materials.

7.2.9 That construction procedures used for the project are in conformance with:

(a) all applicable codes and standards;

(b) the specific requirements of any regulatory agency;

(c) the correct technical interpretation of the specifications in any contract between the distributor and the person undertaking the construction project.

7.2.10 That suitable testing procedures are developed and utilized to qualify any person who will be engaged in:

(a) welding of steel pipelines;

(b) high energy jointing of aluminum pipelines;

(c) fusion of polyethylene pipelines.

7.2.11 That the person undertaking the construction project complies fully with all requirements of legislation and standards respecting the safety of any employee of that person, or any employee or agent of the distributor, or any other person involved in the construction project.

7.2.12 That the location and depth of all buried pipelines and plant, and the location of all above ground appurtenances, is accurately and fully recorded in accordance with the requirements of section 8.

7.3 Project management shall not be carried out by any person who is directly engaged in construction of the project.

7.4 A person appointed as project manager shall be responsible to the distributor for all phases of the construction project as hereinbefore described and, with respect to the construction of a high pressure steel pipeline in a rural gas utility which is classified by the Energy Resources Conservation Board as a Gas Line under the Pipeline Act, the project manager shall also provide the following specialist services as appropriate and as required, subject to prior approval by the Department.

7.4.1 Specialized quality assurance for the manufacture, handling, storage and transportation of line pipe.

7.4.2 Specialized radiographic inspection of welded joints.

7.4.3 Geotechnical analysis of potential soil erosion at sensitive locations on the pipeline right-of-way.

7.4.4 Hydrological analysis of proposed creek crossing locations as may be prescribed by the Department of the Environment of the Province of Alberta.

7.4.5 Legal surveying services for the pipeline right-of-way.

7.4.6 Archaeological survey and historical impact analysis as may be prescribed by the Department of Culture of the Province of Alberta.

7.4.7 Testing and qualification of persons to be engaged in jointing of pipelines.

7.5 The type and extent of project management to be provided for a construction project may be subject to prior approval by the Department.

8. Surveying

8.1 A pre-construction survey shall be carried out for all pipelines to be installed in a rural gas utility to ensure that:

8.1.1 Pipelines and plant will be located in accordance with design plans.

8.1.2 All other pipelines and cable to be crossed are accurately located.

8.1.3 If applicable, tie-in points to the existing distribution system are in accordance with designs.

8.1.4 All specific requirements of a utility right-of-way agreement, respecting routing of pipelines in accordance with a landowner's specifications, are complied with in all respects.

8.1.5 The person undertaking construction of the pipelines and plant is provided with a surveyed and staked-out route to follow in order that deviations from design plans are minimized.

8.2 Where a pre-construction survey reveals that a more practical and efficient routing is available, the surveyor may stake this alternative routing only if it falls within the limitations of the utility right-of-way agreement, the permit issued by the

Energy Resources Conservation Board, and the construction approval issued by the Department.

8.3 Following construction of a pipeline in a rural gas utility, a distributor shall ensure that a detailed as-built survey is conducted on that pipeline in accordance with the requirements of section 8.5 to accurately locate and record the actual routing of that pipeline, to record the actual configuration and location of all above ground appurtenances, and, where applicable, to record any specific deviations from normal pipeline depth.

8.4 The Department may require a distributor to demonstrate that the procedures to be used for an as-built survey pursuant to subsection 8.3 will provide an accurate record of the location and depth of a pipeline.

8.5 An as-built survey in a rural gas utility shall meet the following requirements:

8.5.1 The points at which the distribution system crosses section lines, quarter section lines, roads, highways, railways, canals, rivers or other major watercourses and other pipelines shall be surveyed and dimensioned for as-built drawing information to an accuracy of ± 15 metres.

8.5.2 At all other locations, pipelines shall be surveyed to an accuracy of ± 15 metres and plotted – but not dimensioned – on as-built drawings to reflect that accuracy.

8.5.3 Notwithstanding the degrees of accuracy specified in subsections 8.5.1 and 8.5.2, a pipeline shall be plotted for as-built drawing purposes in the quarter section, legal subdivision, or lot in which it is actually installed.

9. As-Built Drawings

9.1 All pipelines and plant in a rural gas utility shall be accurately located in accordance with subsection 8.5 on as-built drawings of the type and specification described in this section.

9.2 The requirements of subsection 9.1 shall remain in effect notwithstanding any other requirement by any other person or agency to provide separate as-built drawings to a different scale or standard from those specified in this section.

9.3 As-built drawings produced under this section shall be compiled from standard size 22 inches by 34 inches mylar of 0.003 inches thickness with matt finish both sides.

9.4 Pre-printed blank mylar paper as specified in subsection 9.3 may be supplied by the Department or, upon approval by the Department, by the distributor, for the preparation of as-built drawings under this section.

9.5 As-built drawings for a rural gas utility shall comprise of the following individual types of drawings:

9.5.1 Key plans – to provide an overall pictorial view of the layout of a distribution system. This plan may be drawn to any convenient scale.

9.5.2 Legend and Specification Plan – to outline the standard symbols to be used in all township, urban, and detail plans, and standard techncial specifications for all line pipe which may be installed in a rural gas utility.

9.5.3 Township plan – to provide an accurate record of the location of all pipelines and plant installed in a specific township within the franchise area of a rural gas utility.

9.5.4 Detail plans – this type of plan shall provide larger scale details of pipelines and plant installed in urban areas or subdivisions, enlarged details from township plans, or details of typical crossings and above ground appurtenances.

9.6 As-built drawings shall be drafted to a scale of 1:20 000 for all township drawings and to an appropriate standard scale for any other type of plan in accordance with CGSB Standard 88-GP-20M (October 1975) as far as is practical and provided that sufficient clarity is achieved:

1:	1 000 000	1:	1 000
1:	500 000	1:	500
1:	250 000	1:	200
1:	200 000	1:	100
1:	100 000	1:	50
1:	50 000	1:	20
1:	20 000	1:	10
1:	10 000	1:	5
1:	5 000	1:	2
1:	2 000	1:	1

9.7 Standard pipeline symbols as adopted by the Energy Resources Conservation Board shall be used for as-built drawings of a rural gas utility.

9.8 Lettering of as-built drawings shall be by Leroy pen only and freehand lettering shall not be used in any part of an as-built drawing.

9.9 A standard system of plan numbers shall be used for as-built drawings as follows:

9.9.1 Drawing numbers for all plans shall be preceded with a 4-digit number to identify the distributor from the listing in Appendix II.

9.9.2 Key plans shall be identified by the series number 100.

9.9.3 Legend and specification plans shall be identified by the series number 200.

9.9.4 Township plans shall be indentified by township-range meridian numbers as applicable.

9.9.5 Detail plans or urban areas and subdivision shall be identified by the series number 300.

9.9.6 Detail plans of typical crossings and above ground appurtenances, or enlarged details from township drawings, shall be identified by the series number 500.

9.9.7 Detail plans of franchise area boundaries shall be identified by the series number 700.

9.10 Franchise area boundaries shall be shown on all key plans and all township plans where the franchise area boundary falls within those townships.

9.11 Township plans shall include such topographical details as highways, railways, roads, waterways, cities, towns, villages, hamlets, muskeg, bush or any other prominent surface feature as may be necessary or beneficial to the distributor for operation of its distribution system.

9.12 Township plans shall include the location of all foreign pipelines which shall be identified by the name of the owners of those pipelines.

9.13 The accuracy of location of pipelines and plant on as-built drawings shall be as prescribed by subsection 8.5.

PART C

CONSTRUCTION

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1. General Construction Requirements

1.1 Construction of any pipeline in a rural gas utility shall not commence until the distributor or its agent is in receipt of the necessary approvals or permits from any person or authority having jurisdiction over the pipeline construction including:

1.1.1 the owner of the land(s) through which the pipeline is to be installed shall have signed a utility right-of-way or other easement document which legally grants permission for the distributor to install its pipeline.

1.1.2 The Energy Resources Conservation Board shall have issued a permit to the distributor unless the pipeline(s) to be installed does not require such a permit prior to installation.

1.1.3 the Plumbing and Gas Safety Services Branch of the Department of Labour shall have issued a permit to the distributor unless the pipeline(s) to be installed does not require such a permit prior to installation.

1.2 All construction in a rural gas utility shall conform with the applicable requirements of all regulatory permits and/or approvals and in accordance with all applicable codes and regulations.

1.3 All pipeline installations in a rural gas utility shall proceed only in accordance with approved designs and specifications for such installations, and in accordance with recognized safety practices.

2. Materials Handling

2.1 Distributors shall ensure that suitable techniques are developed and utilized to prevent damage to materials during transportation, storage, and installation.

2.2 During transportation, all materials shall be loaded and secured to the vehicle in a suitable manner such that damage to materials is prevented. Line pipe in particular shall be protected by:

2.2.1 ensuring that the vehicle is free of protruding nails or other sharp objects which could damage the pipe.

2.2.2 ensuring that the pipe is firmly secured and properly supported to prevent spillage from the vehicle.

2.3 Materials shall be stored and handled in a suitable manner to prevent damage from mechanical handling equipment, other vehicles, and weather conditions.

2.4 Straight lengths or coils of line pipe shall be stacked to a maximum height such that damage to bottom layers by crushing does not occur.

3. Use of Utility Rights-of-Way

3.1 Installation of any pipeline in a rural gas utility shall be preceded in all instances by acquisition of a suitable easement or utility right-of-way which is suitable for registration at the Land Titles Office.

3.2 Selection of a utility right-of-way for pipeline installation shall take account of the various factors outlined in Part B, section 5.

3.3 Where a utility right-of-way for pipeline construction in a rural gas utility is proposed to cross an existing right-of-way for any other underground utility pipeline or cable, special care shall be taken to prevent damage to that pipeline or cable by carefully and clearly marking the location of the pipeline or cable in accordance with the requirements of the Energy Resources Conservation Board.

4. Pipeline Jointing

4.1 Any person who will be engaged in

4.1.1 welding of steel pipelines

4.1.2 high energy jointing of aluminum pipelines

4.1.3 fusion of polyethylene pipelines shall be qualified and competent to carry out the necessary techniques for high quality jointing of the materials to be installed.

4.2 A distributor shall undertake to test any person who will be engaged in pipeline jointing in accordance with the following requirements:

4.2.1 for welding of steel pipelines, the testing procedures outlined in clause 4.8 of CSA Standard Z184-M1979 shall be followed.

4.2.2 for high energy jointing of aluminum pipelines, the testing procedure outlined in clause 12.4.4.1.2. of CSA Standard Z169-M1979 shall be followed.

4.2.3 for fusion of polyethylene pipe, three (3) acceptable fusion welds shall be produced in accordance with the polyethylene pipe manufacturer's recommended procedure for the product being used. A person continuously employed by a company and regularly making fusion weld joints shall be required to requal-

ify by this test method at intervals not longer than 1 year. A person not so employed and who has not performed fusion welds for the past 3 months shall be required to requalify prior to undertaking any further fusion welds.

4.3 A distributor shall prepare and maintain a record of qualification tests pursuant to section 4.2, including the test methods used and the results achieved.

4.4 Jointing of aluminum pipe shall be by high energy weld only in accordance with the pipe manufacturer's recommended procedure. Jointing of straight lengths of 88.9 mm or greater diameter shall be subject to ultrasonic testing to ensure proper bonding, with a minimum of 50 per cent of all mainline joints, and 100 per cent of any tie-in joints, being subjected to an ultrasonic test. Any person who is engaged to carry out ultrasonic testing shall be certified in this respect in accordance with CGSB Standard 48-GP-7a, Certification of Nondestructive Testing Personnel (Ultrasonic Category)

4.5 A person undertaking fusion welds of polyethylene pipe shall take account of the manufacturer's recommended procedures, particularly where mixing of resin types is involved.

5. Pipeline Installation

5.1 Pipeline installation shall be carried out in a manner which will prevent damage to pipe and coating, and which will prevent undue stress on any pre-made joints.

5.2 Where a pipeline is to be installed in a pre-cut ditch, particular care shall be taken to ensure that:

5.2.1 the ditch is free of any large stones or other abrasive materials.

5.2.2 the ditch is backfilled with a material composition and in such a manner as to prevent damage to the installed pipeline.

5.3 Field bending of pipelines for installation shall not exceed the tolerances specified in the appropriate code. For polyethylene pipe, field bends shall have a minimum radius of at least 25 times the outside diameter of the pipe, as detailed in Part E, Appendix III, Figure 5.16.

5.4 Tracer wire meeting the specifications of Part B, section 4.5 shall be installed simultaneously with all polyethylene pipe installations.

5.5 Plowing of polyethylene pipe in cold weather conditions shall take account of ambient air temperature limitations as prescribed by the pipe manufacturer and/or the Energy Resources Conservation Board.

5.6 Pipeline and plant installation shall generally follow the basic design principles outlined in Appendix III but distributors may utilize a modified design where safety and operational efficiency can be maintained.

PART D

OPERATION

AND

MAINTENANCE

SECTION	TITLE	PAGE
1	General Requirements for Utility Operations	20
2	System Inspection and Maintenance	21
3	Consumer Service	21

1. General Requirements for Utility Operations

1.1 A distributor shall develop and maintain an organized and functioning operation and maintenance system which is sufficient in scope and structure to permit its rural gas utility to provide safe and continuous service to consumers, to operate in accordance with the provisions of the Energy Resources Conservation Board license and all applicable codes and legislation, and to ensure to the best of its ability that unsafe conditions in its distribution system are avoided at all times.

1.2 The Department may require a distributor to demonstrate that it is able to meet the critical requirements outlined in section 1.1.

1.3 A distributor may at its sole option appoint an agent to carry out the operation and maintenance of its distribution system.

1.4 A distributor shall at all times maintain such resources as are necessary to permit immediate and effective response to any emergency situation. The resources required shall include sufficient trained and qualified personnel, vehicles and tools, and the necessary communications system to permit a consumer or any other person to advise the distributor of any emergency without delay.

1.5 The role and responsibilities of an employee or an agent engaged to carry out the operation and maintenance of a distribution system shall be clearly defined in writing by the distributor, and shall be made available to the Department, and to the employee or agent as the case may be, upon request. This requirement shall apply in particular to procedures for handling emergency situations.

1.6 A distributor shall at all times maintain a manual of operating and maintenance procedures which is appropriate to the features of its distribution system including system size, the number and type of consumers served, the materials and equipment utilized, and the pressures at which the system is operated. A copy of the manual shall be made available to the Department upon request.

1.7 A distributor may at its option utilize the standard "Operation and Maintenance Manual" available from the Department or it may develop its own manual provided that its contents are compatible with all applicable codes and regulations and with the basic contents of the manual available from the Department taking into account the distribution system features outlined in section 1.6.

1.8 A distributor shall maintain accurate and complete plant location records of its distribution system in accordance with the specifications of Part B, section 9, and shall provide any information with respect to location of plant upon request to any person who may be involved in any form of ground disturbance activity within proximity to the distributor's plant.

1.9 A distributor shall maintain in good order such tools, instruments, and equipment as are necessary to effectively operate and maintain its distribution system. Such tools, instruments, and equipment shall include, but need not necessarily be limited to, the following:

1.9.1 a suitable pipe location instrument

1.9.2 a suitable combustible gas indicator

1.9.3 an adequate range of pressure gauges

1.9.4 an adequate range of small hand tools

1.9.5 an adequate supply of spare parts, fittings, and other necessary inventories

1.9.6 an adequate supply of first aid equipment

1.10 A distributor shall develop a form of gas balance check between wholesale purchases and retail sales of natural gas.

1.11 A distributor shall develop and maintain an adequate series of documentation and records to support the operation of its rural gas utility. Such documentation and records shall include, but need not necessarily be limited to, the following:

1.11.1 a suitable form to record the circumstances surrounding line leaks or breaks pursuant to the requirements of Part 8, Section 63 of the Pipeline Regulations of the Energy Resources Conservation Board.

1.11.2 a suitable form to record all service work and service calls on consumer's facilities.

1.11.3 a suitable system to record all inspection, maintenance, and small repairs on the distribution system.

1.11.4 a suitable system to record all pertinent and necessary information on consumers.

1.12 During the steady state operation of a pipeline, the operating pressure of that pipeline shall not exceed the Maximum Operating Pressure as prescribed in the Energy Resources Conservation Board license for that pipeline.

1.13 Notwithstanding section 1.12, the pressure in a pipeline shall not be permitted to exceed the overpressure tolerance allowed for the appro-

priate code or standard during pigging operations, pressure surges, or any other situation where over-pressuring might occur.

2. System Inspection and Maintenance

2.1 A distributor shall develop and implement a suitable schedule or regular inspection and maintenance for its distribution system plant in order that all plant may continuously function in a safe and reliable manner.

2.2 The inspection and maintenance schedule referred to in section 2.1 shall include at least the following:

2.2.1 periodic inspection of customer PFM sets

2.2.2 bi-annual inspection of cathodic protection facilities

2.2.3 annual inspection of intermediate regulator stations

2.2.4 regular inspection of any odorizing facility operated by the distributor

2.2.5 annual inspection of system isolation valves to ensure that such valves may be readily activated as and when required

2.2.6 regular inspection of pipeline warning signs to ensure that signs have not been knocked down or badly damaged, and to determine if information on the sign is legible

2.2.7 periodic painting of above ground plant as appropriate to provide identification and to prevent corrosion

2.2.8 annual inspection of all pressure relief devices to determine operating integrity and condition

2.3 All inspection and maintenance work shall be recorded pursuant to section 1.11.3, and the record shall be made available to the Department upon request.

3. Consumer Service

3.1 A distributor shall respond to a request for service from any consumer to whom it provides a natural gas supply.

3.2 A response to a request for service shall suit the degree of urgency required. Where danger to life and/or property is concerned, the response shall be immediate and effective.

3.3 Notwithstanding section 3.2, a distributor may refer a request for service to another person where it is certain that:

3.3.1 it has liability or responsibility for the scope of service requested,

3.3.2 it is able to advise the consumer as to which person may provide the scope of service requested, or it is able to refer the request to the appropriate person directly, and

3.3.3 a referral will not aggravate the seriousness of any hazard which may be involved.

3.4 A distributor shall record any request for service immediately upon receipt of such a request, and it shall also record the action taken in response, pursuant to section 1.11.2.

3.5 If a distributor in the performance of its duties discovers an unsatisfactory condition within a consumer's premises or facilities, it shall take the following action:

3.5.1 immediately advise the consumer of the unsatisfactory condition

3.5.2 if necessary, turn off the gas supply to the consumer's premises or facilities, and

3.5.3 complete an appropriate report and submit copies to:

(a) the consumer,

(b) the Plumbing & Gas Safety Services Branch of the Department of Labour,

(c) the distributor's customer records made pursuant to section 1.11.4.

3.6 A distributor shall be aware of the limitations of its employees or agents in responding to requests for service in customer's premises with respect to gasfitting work as defined under the Gas Protection Act.

PART E

APPENDICES

APPENDIX	TITLE	PAGE
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II	Distributor Reference Numbers For As-Built Drawings	26
III	Typical Pipeline and Plant Installation Details	27

APPENDIX I

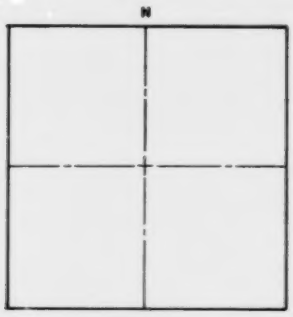
TYPICAL LOAD SURVEY FORM

Alberta

UTILITIES AND TELEPHONES

LOAD SURVEY FORM FOR RURAL GAS UTILITIES

NAME OF DISTRIBUTOR: _____ TELEPHONE: _____



NEW SURVEY ☐

RESURVEY CHANGED ☐ UNCHANGED ☐

THE DIAGRAM SHOWN REPRESENTS THE SECTION ON WHICH THE FARMSTEAD IS LOCATED. PLEASE INDICATE THE POSITION OF THE FARMSTEAD AND COMPLETE THE INFORMATION BLANKS BELOW.

OWNERS NAME: _____ TELEPHONE: _____

1/4 SECTION _____ SECTION _____

TOWNSHIP _____ RANGE _____ W. OF _____ MERIDIAN

SURVEYED BY: _____

DATE OF SURVEY: _____

PRESENT BTU/HR. REQUIREMENTS

APPLIANCE	TYPE OF BUILDING	BUILDING DIMENSIONS	BASEMENT	NO. OF STOREYS	BTU/HR.
FURNACE			YES NO		
FURNACE			YES NO		
FURNACE			YES NO		
C.H. BOILER			YES NO		
			YES NO		
			YES NO		
			YES NO		
WATER HEATER					
WATER HEATER					
CLOTHES DRYER					
STOVE					

FUTURE BTU/HR. REQUIREMENTS

APPLIANCE	TYPE OF BUILDING	BUILDING DIMENSIONS	BASEMENT	NO. OF STOREYS	YEAR	BTU/HR.
			YES NO			
			YES NO			
			YES NO			
			YES NO			

LARGE LOAD EQUIPEMENT

GAS ENGINE BHP _____ X 12 000 BTU/HR. = ☐

MAXIMUM SEASONAL USE _____ TO _____

NUMBER OF HOURS IN OPERATION PER DAY = _____ AVERAGE

GRAIN DRYER . . . . . ☐

MAXIMUM SEASONAL USE _____ TO _____

OTHER (SPECIFY) . . . . . ☐

REMARKS - EXISTING METER TYPE AND SIZE (IF APPLICABLE) _____

_____

_____

APPENDIX II

DISTRIBUTOR REFERENCE NUMBERS FOR AS-BUILT DRAWINGS

DISTRIBUTOR NAME	REFERENCE NO.
Alder Flats Gas Co-op Ltd	1496
Ankerton Gas Co-op Ltd	1392
Atlee Gas Co-op Ltd	1783
Bassano Gas Co-op Ltd	1737
Battle River Gas Co-op Ltd	1380
Benjamin Gas Co-op Ltd	1801
Big Country Gas Co-op Ltd	1643
Birch Hills Gas Co-op Ltd	1728
Bowell Gas Co-op Ltd	1776
Bow River Gas Co-op Ltd	1755
Buck Lake Gas Co-op Ltd	1456
Buck Mountain Gas Co-op Ltd	1781
Burnt Lake Gas Co-op Ltd	1433
Central Peace Gas Co-op Ltd	1809
Chain Lakes Gas Co-op Ltd	1763
Chief Mountain Gas Co-op Ltd	1739
Chinook Gas Co-op Ltd	1746
Chin Coulee Gas Co-op Ltd	1729
Cochrane Lake Gas Co-op Ltd	1633
Coronado Gas Co-op Ltd	1630
County of Athabasca	9312
County of Smoky Lake	9313
County of Thorhild	9307
County of Two Hills	9321
County of Vermilion River	9324
Crossroads Gas Co-op Ltd	1697
Dalum Gas Co-op Ltd	1535
Deer Creek Gas Co-op Ltd	1719
Diamond Valley Gas Co-op Ltd	1383
Dinosaur Gas Co-op Ltd	1724
Dry Country Gas Co-op Ltd	1648
East Central Gas Co-op Ltd	1634
East Peace Gas Co-op Ltd	1635
East Smoky Gas Co-op Ltd	1761
Evergreen Gas Co-op Ltd	1787
Foothills Gas Co-op Ltd	1771
Forty Mile Gas Co-op Ltd	1756
Gem Gas Co-op Ltd	1272
Gull Lake Gas Co-op Ltd	1381
I & J Gas Co-op Ltd	1492
Iron Creek Gas Co-op Ltd	1752

DISTRIBUTOR NAME	REFERENCE NO.
Kneehill Gas Co-op Ltd	1368
Lac La Biche Gas Co-op Ltd	1640
Lamco Gas Co-op Ltd	1667
Little Bow Gas Co-op Ltd	1751
Livingstone Gas Co-op Ltd	1545
Lobstick Gas Co-op Ltd	1705
Meota Gas Co-op Ltd	1205
Minco Gas Co-op Ltd	1641
Montana Tribal Band	6002
Natural Gas Co-op #52 Ltd	1742
North East Gas Co-op Ltd	1773
North Edmonton Gas Co-op Ltd	1289
Northern Lights Gas Co-op Ltd	1805
North Peace Gas Co-op Ltd	1603
Orkney Gas Co-op Ltd	1521
Paintearth Gas Co-op Ltd	1616
Pekisko Gas Co-op Ltd	1631
Pembina River Gas Co-op Ltd	1525
Prairie River Gas Co-op Ltd	1760
Rocky Gas Co-op Ltd	1645
Rockyview Gas Co-op Ltd	1758
Rosebud Gas Co-op Ltd	1686
Rosemary Gas Co-op Ltd	1468
Samson Tribal Band	6001
South Flagstaff Gas Co-op Ltd	1559
S.R. & B. Gas Co-op Ltd	1290
Ste. Anne Gas Co-op Ltd	1637
Summerview Gas Co-op Ltd	1741
Sunshine Gas Co-op Ltd	1727
Swan River Gas Co-op Ltd	1355
Three Hills Gas Co-op Ltd	1322
Three Rivers Gas Co-op Ltd	1749
Tirol Gas Co-op Ltd	1225
Toki Gas Co-op Ltd	1817
Triple W Gas Co-op Ltd	1575
Wainedge Gas Co-op Ltd	1766
Washout Creek Gas Co-op Ltd	1477
West Parkland Gas Co-op Ltd	1636
West Thorhild Gas Co-op Ltd	1530
Wintering Hills Gas Co-op Ltd	1568
Yellowhead Gas Co-op Ltd	1725

APPENDIX III
TYPICAL PIPELINE AND PLANT INSTALLATION DETAILS

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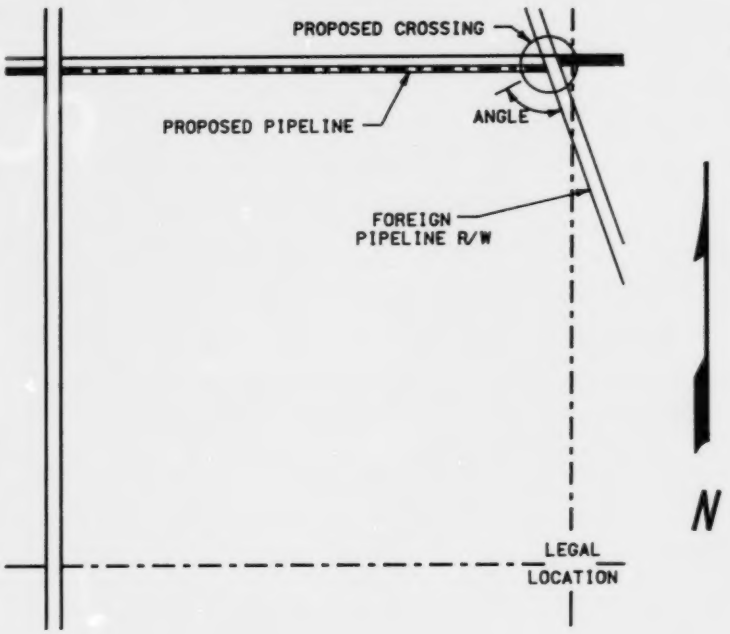
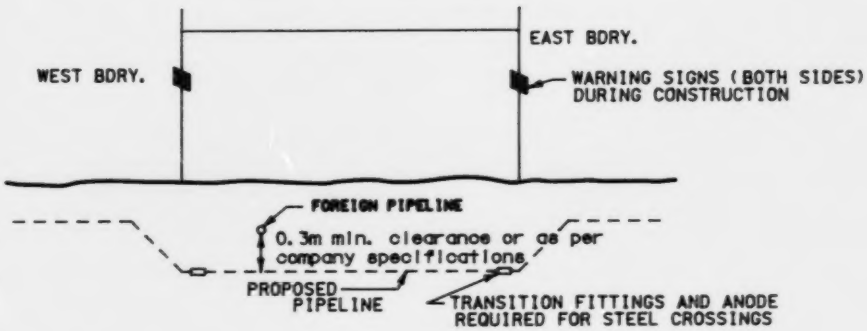
5.14	Typical self-tapping saddle tee	41
5.15	Hot Tie-In	42
5.16	Minimum Radius of Curvature for Direct Burial (Plowing) of Polyethylene Pipe	43



CARRIER PIPE DETAIL

CONVEYING NATURAL GAS

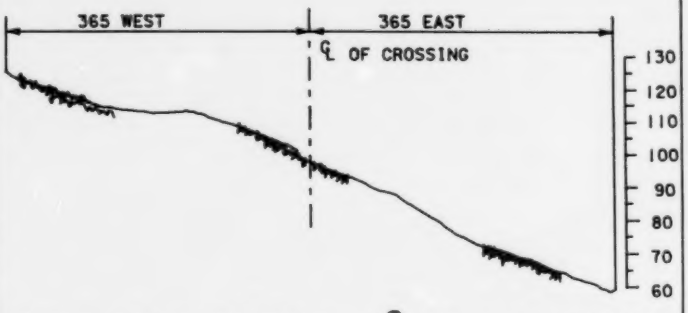
LOCATION PLAN



TYPICAL CROSS-SECTION

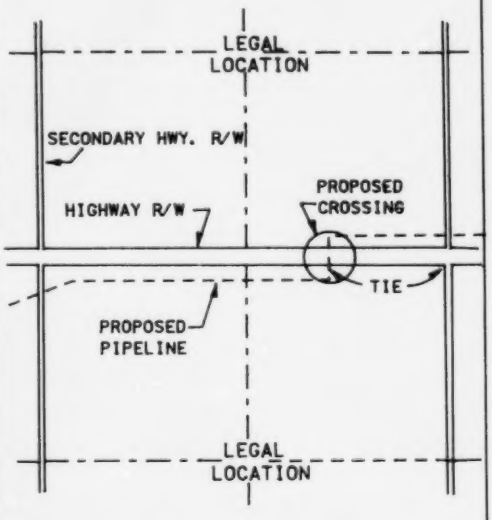
Alberta
UTILITIES AND TELEPHONES

FIG. 5.1 TYPICAL PIPELINE CROSSING

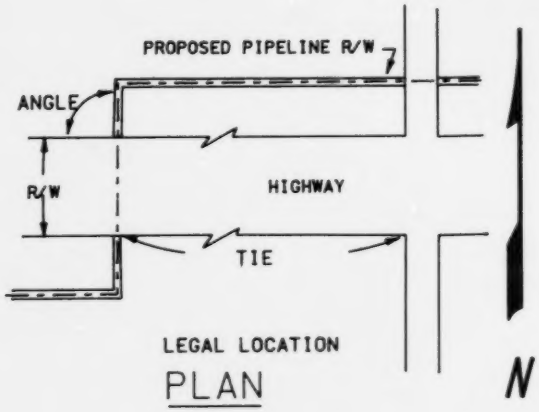


PROFILE ALONG ℄ OF HIGHWAY

NOTE: These dimensions meet the Dept. of Transportation requirements, but the min. E.R.C.B. requirements are 1.10m.



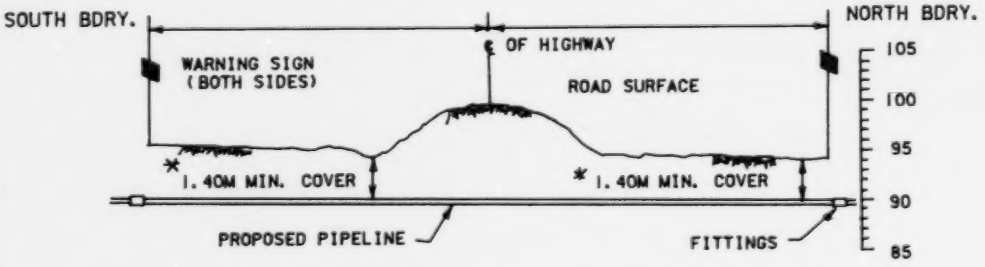
LOCATION PLAN



PLAN

CARRIER PIPE DETAIL

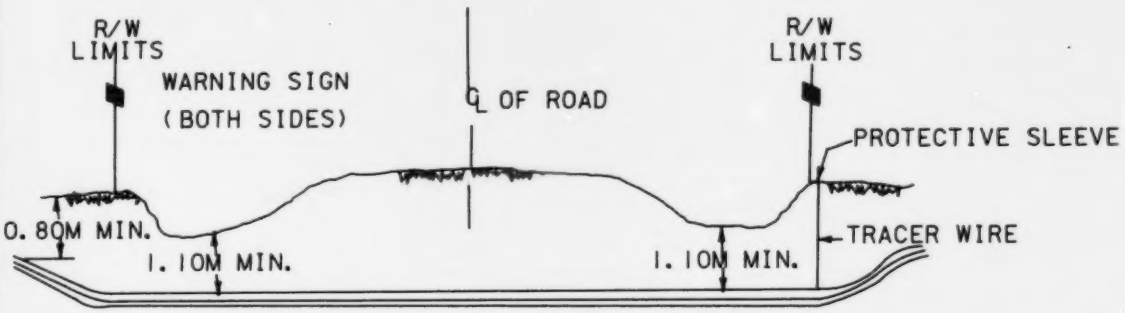
CONVEYING NATURAL GAS



CROSS-SECTION OF R/W AT CROSSING

Alberta
UTILITIES AND TELEPHONES

FIG. 5.2 TYPICAL HIGHWAY CROSSING



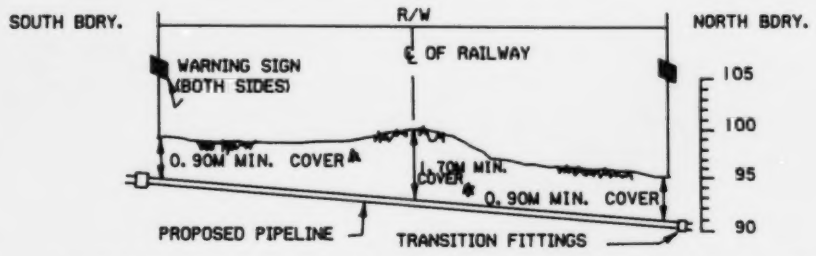
TYPE OF PIPELINE	PIPE INSTALLED ACROSS R/A	FITTINGS OR JOINTS
POLYETHYLENE SDR 11	SCHEDULE 40 STEEL	CSA APPROVED TRANSITION FITTINGS
SDR 11	SDR 8.8 SDR 11 ENCASED IN SDR 11	BUT FUSIONS PE COUPLINGS FUSED

NOTES

1. TEST LEAD TERMINAL C/W ANODE INSTALLED ON ALL PE TO STEEL ROAD CROSSINGS.
2. THE CROSSING SHALL CONFORM TO SECTIONS 39 & 40 OF THE PIPELINE ACT.
3. MIN. CROSSING DEPTH MAINTAINED TO THE EDGE OF THE RIGHT-OF-WAY.
4. TRACER WIRE BROUGHT TO SURFACE IN A PROTECTIVE SLEEVE ON BOTH SIDES OF THE RIGHT-OF-WAY OR ON ONE SIDE OF RIGHT-OF-WAY AND LAYED CONTINUOUS ACROSS THE RIGHT-OF-WAY

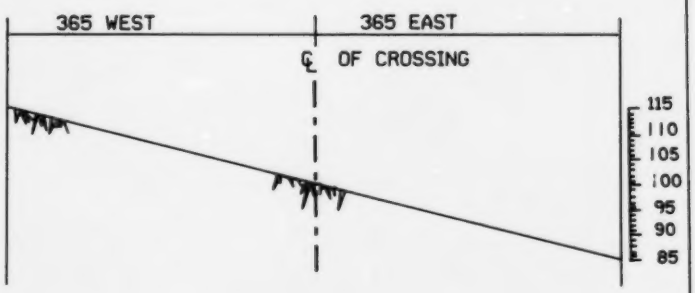
Alberta
UTILITIES AND TELEPHONES

FIG. 5.3 TYPICAL ROAD CROSSING

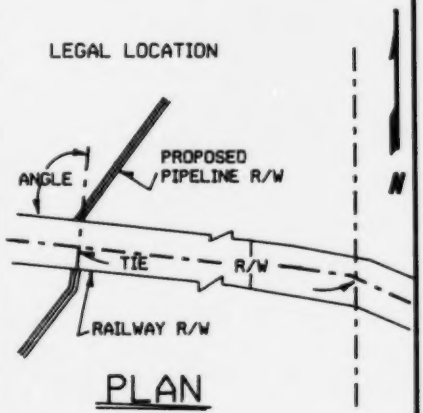


CROSS-SECTION OF R/W AT CROSSING

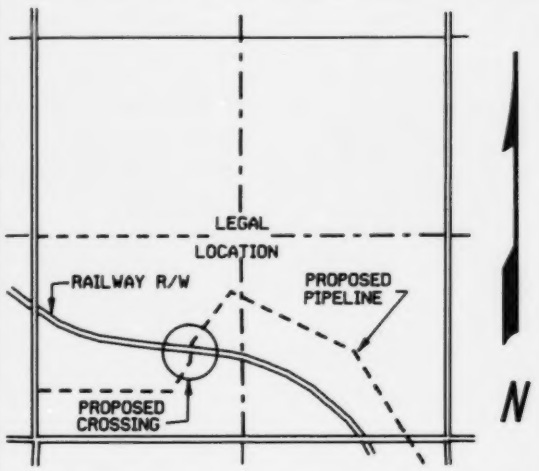
* NOTE THIS DIMENSION MEETS GENERAL ORDER E10 STANDARDS AND EXCEEDS THE E.R.C.B. MIN. REQUIREMENTS



PROFILE ALONG ℄ OF RAILWAY



PLAN



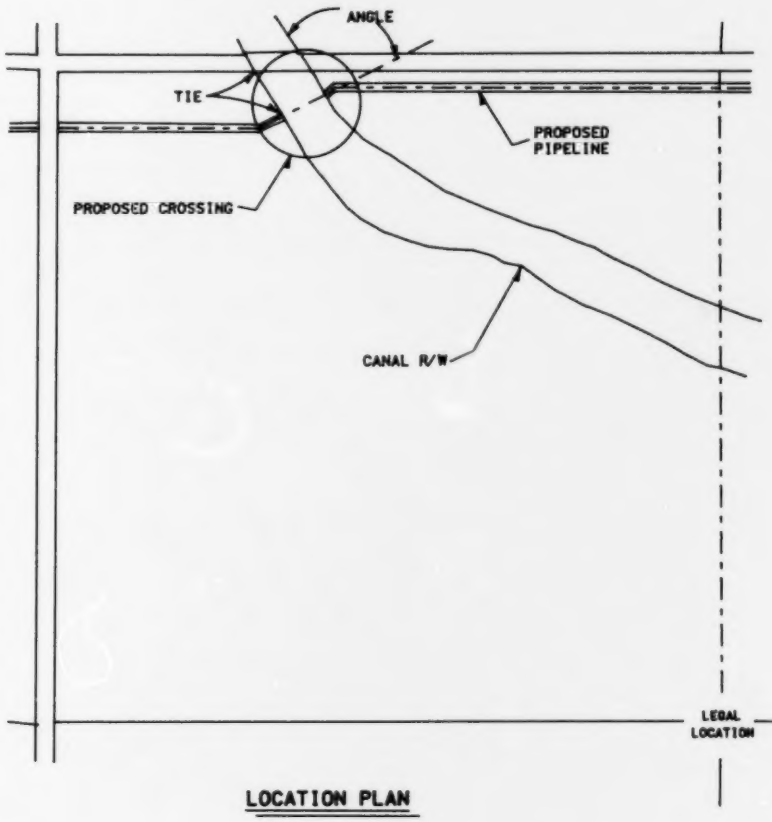
LOCATION PLAN

CARRIER PIPE DETAIL

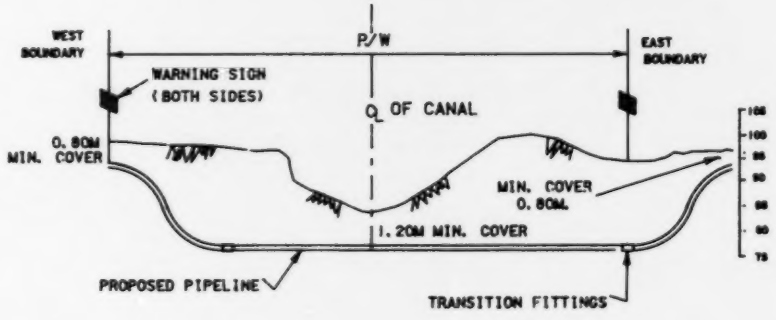
1. CONVEYING NATURAL GAS.
2. PROTECTIVE COATING
3. CATHODIC PROTECTION
4. THIS CROSSING WILL BE BUILT AND MAINTAINED IN ACCORDANCE WITH GENERAL ORDER E10 (AS REVISED AT TIME OF CONSTRUCTION)

Alberta
UTILITIES AND TELEPHONES

FIG. 5.4 TYPICAL RAILWAY CROSSING



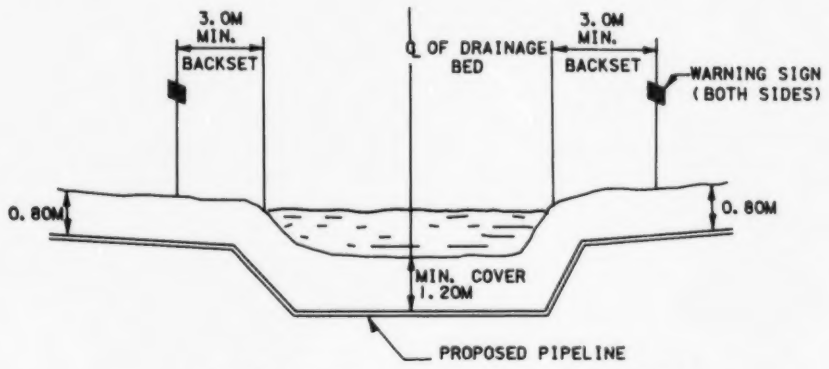
LOCATION PLAN



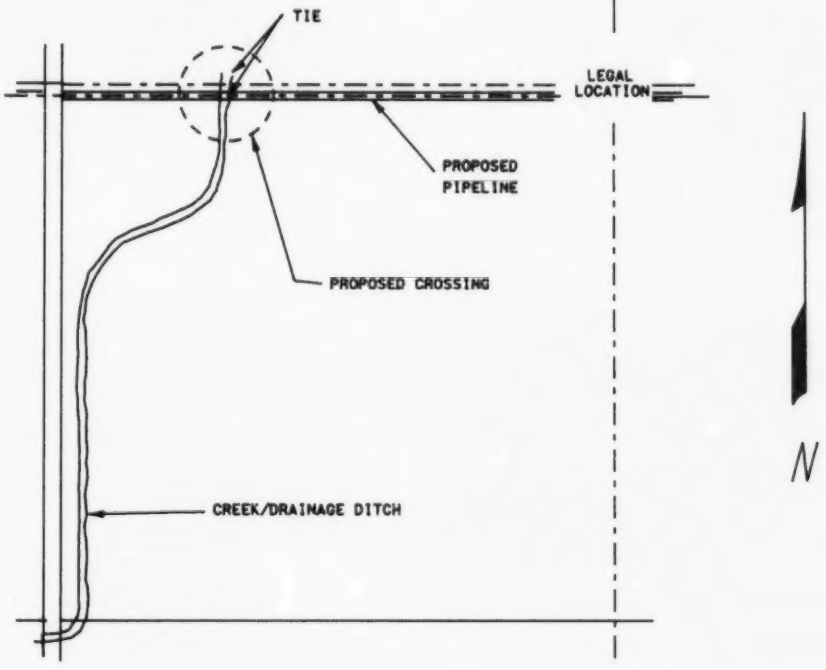
CROSS-SECTION OF R/W AT CROSSING

Alberta
UTILITIES AND TELEPHONES

FIG. 5.5 TYPICAL CANAL CROSSING



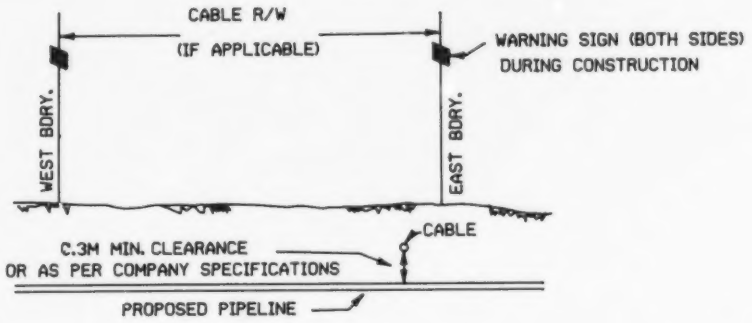
TYPICAL CROSS SECTION



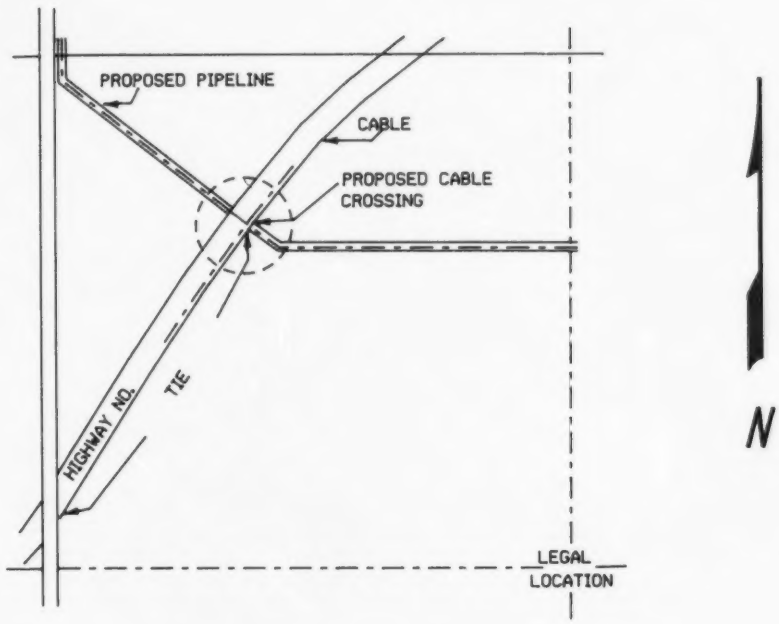
LOCATION PLAN

Alberta
UTILITIES AND TELEPHONES

FIG 5.6 TYPICAL WATERCOURSE CROSSING



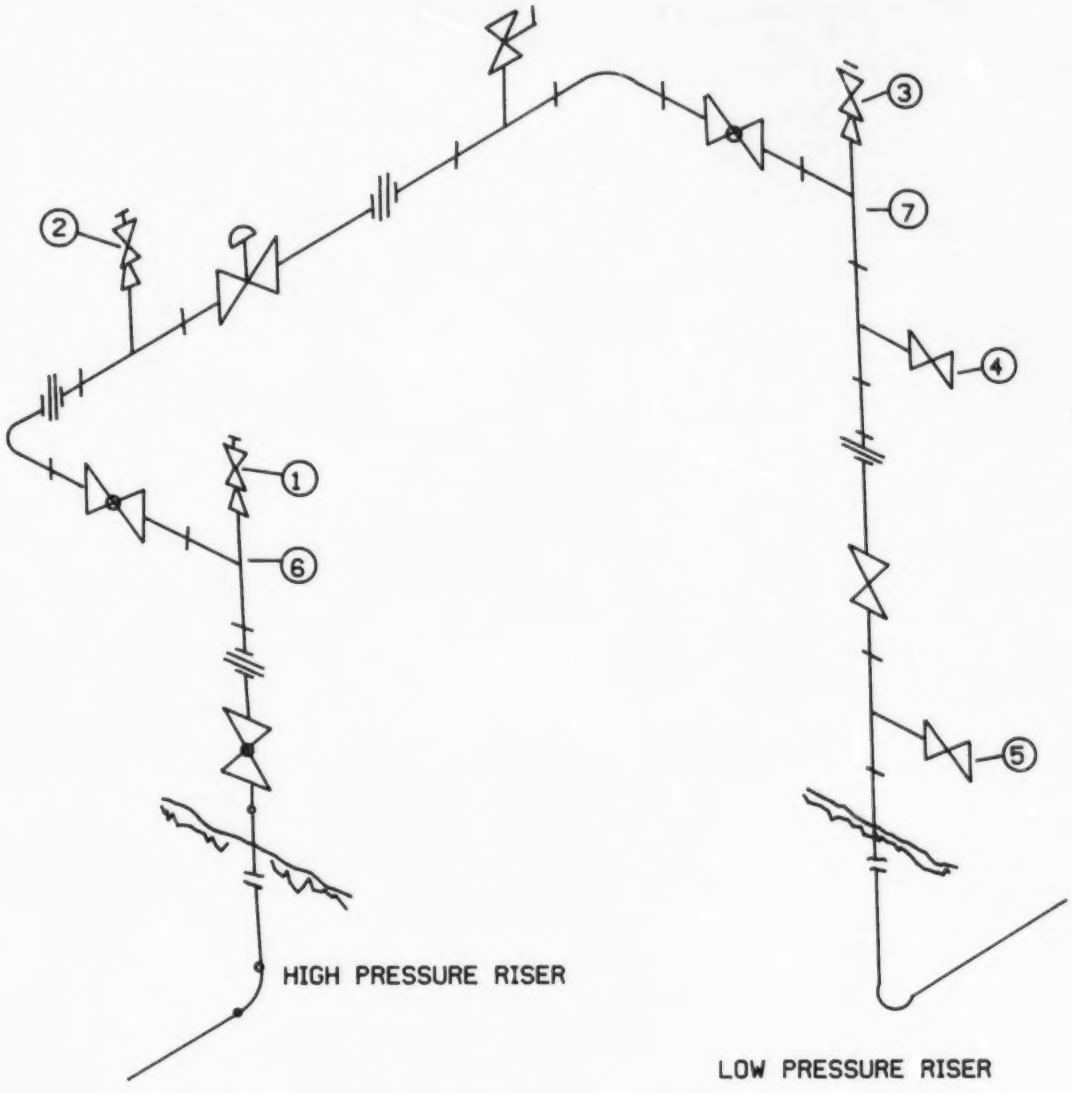
TYPICAL CROSS-SECTION



LOCATION PLAN

Alberta
UTILITIES AND TELEPHONES

FIG 5.7 TYPICAL CABLE CROSSING



NOTE

Optional Equipment

1. DOUBLE RUN REGULATING UNIT -A DUPLICATE HORIZONTAL RUN MAY BE ADDED BETWEEN POINTS INDICATED AS NUMBERS 6 AND 7.

2. ACCOUNTING METER -AN ACCOUNTING METER, INCLUDING EXTRA PIPING REQUIRED, MAY BE ADDED BETWEEN VALUES INDICATED AS 4 AND 5.

3. ALCOHOL INJECTION -THE HIGH PRESSURE SOURCE LINE MAY TIE INTO VALVE NUMBER 1, THE FEEDER LINE MAY TIE INTO VALVE NUMBER 2 AND THE FREEZE-OFF SENSING LINE MAY TIE INTO VALVE NUMBER 3.

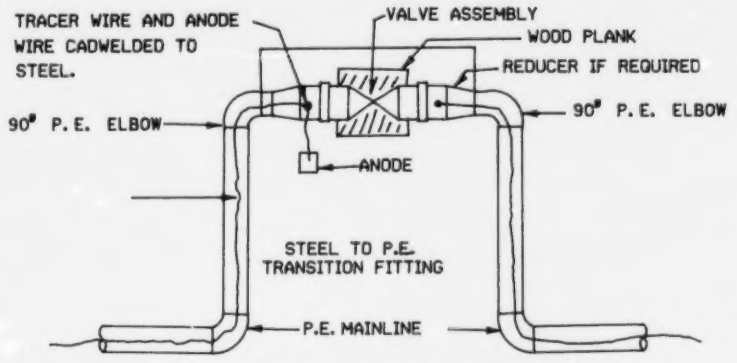
4. CATALYTIC HEATER -THE FUEL SUPPLY LINE MAY BE TIED INTO VALVE NUMBER 3.

5. TEST POINTS -VALVE NUMBER 1 OR 2 MAY SERVE AS AN UPSTREAM TEST POINT AND VALVE NUMBER 3 OR 4 MAY SERVE AS A DOWNSTREAM TEST POINT.

Alberta
UTILITIES AND TELEPHONES

FIG. 5.8 SINGLE RUN REGULATING UNIT

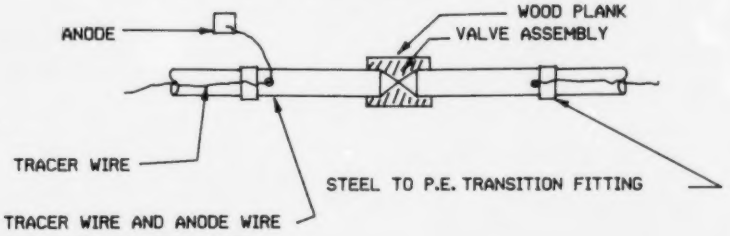
OFF SET



NOTE: VALVE TO BE LOCATED IN A NO TRAFFIC AREA.

NOTE: VALVE TO BE LOCATED IN A NO TRAFFIC AREA.

IN LINE



NOTE: MARKER POST TO BE PLACED WITHIN 0.25M OF VALVE ASSEMBLY.

SECTIONAL DETAIL

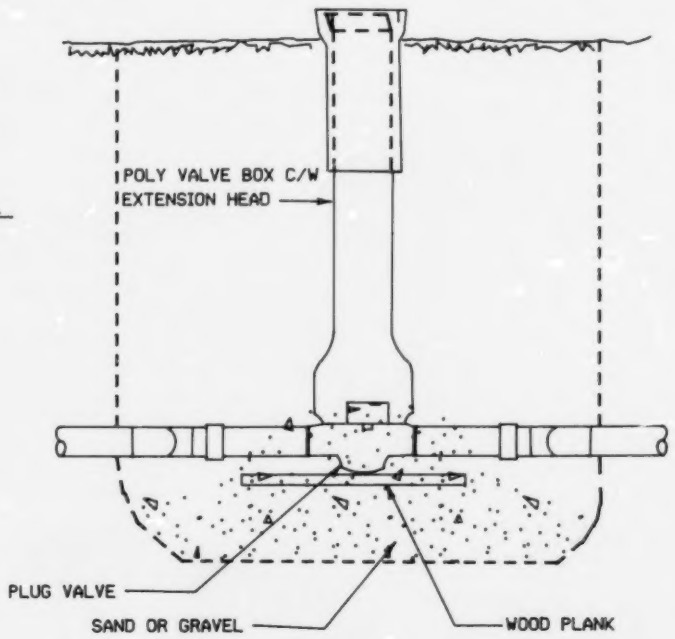


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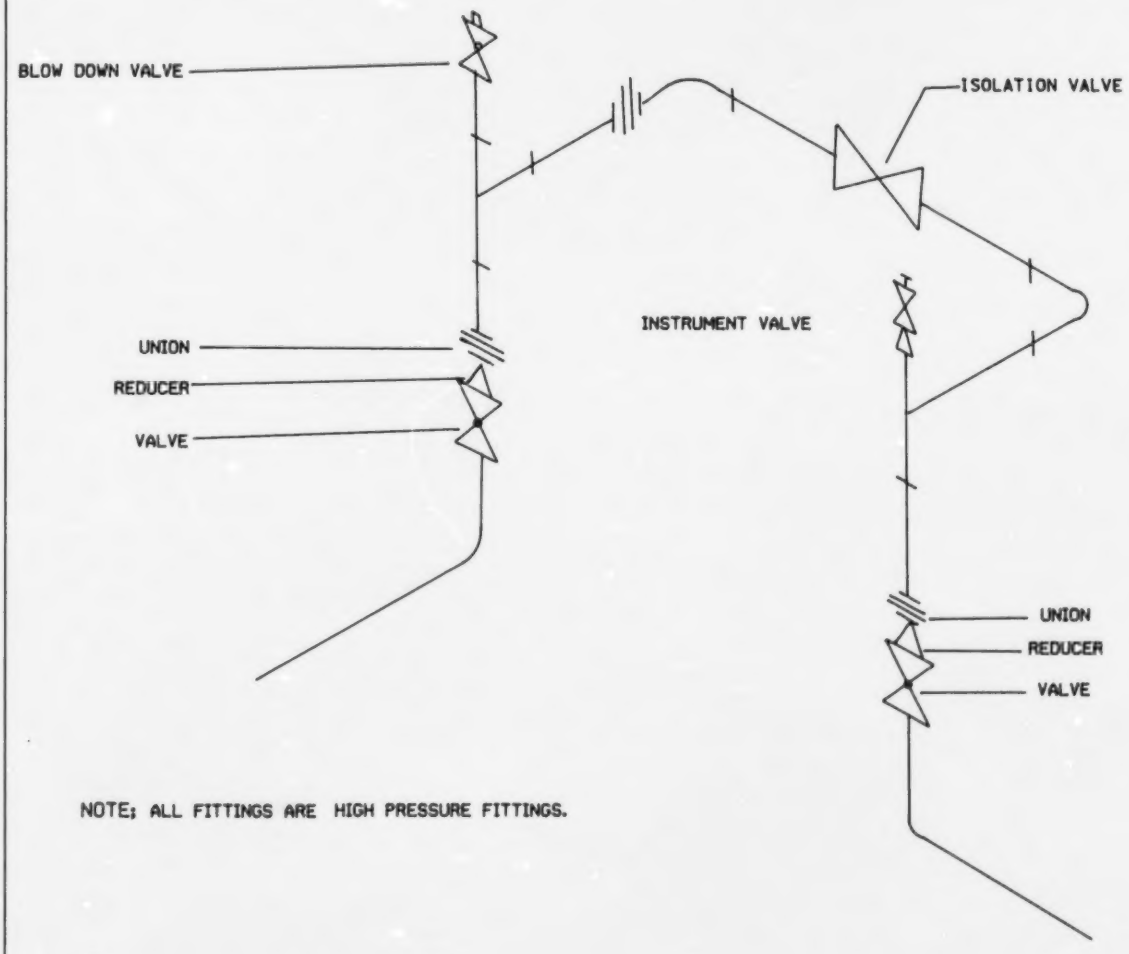
FIG. 5.9 UNDERGROUND VALVE ASSEMBLY



NOTE; ALL FITTINGS ARE HIGH PRESSURE FITTINGS.

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FIG. 5.10 ISOLATION VALVE ASSEMBLY

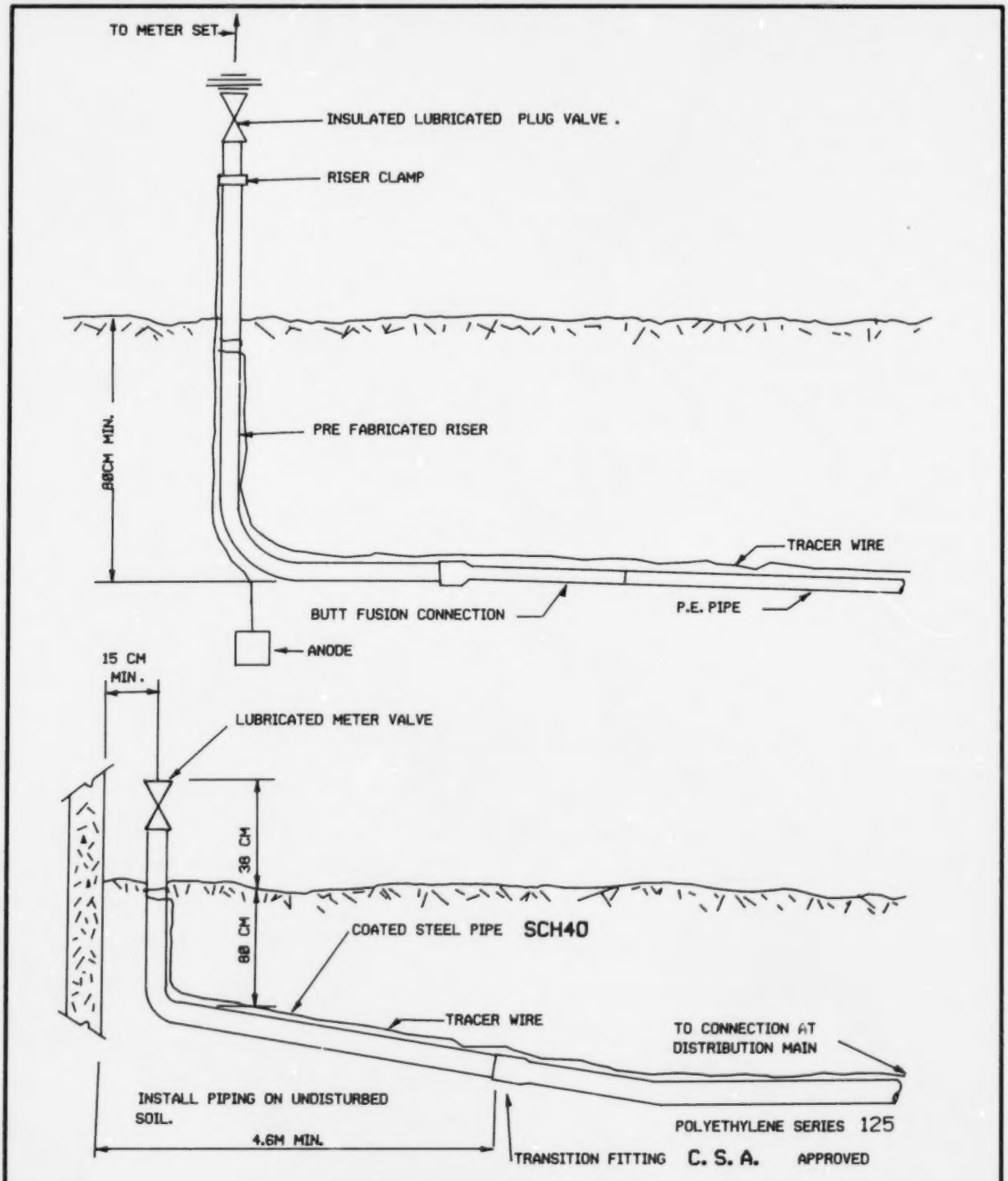

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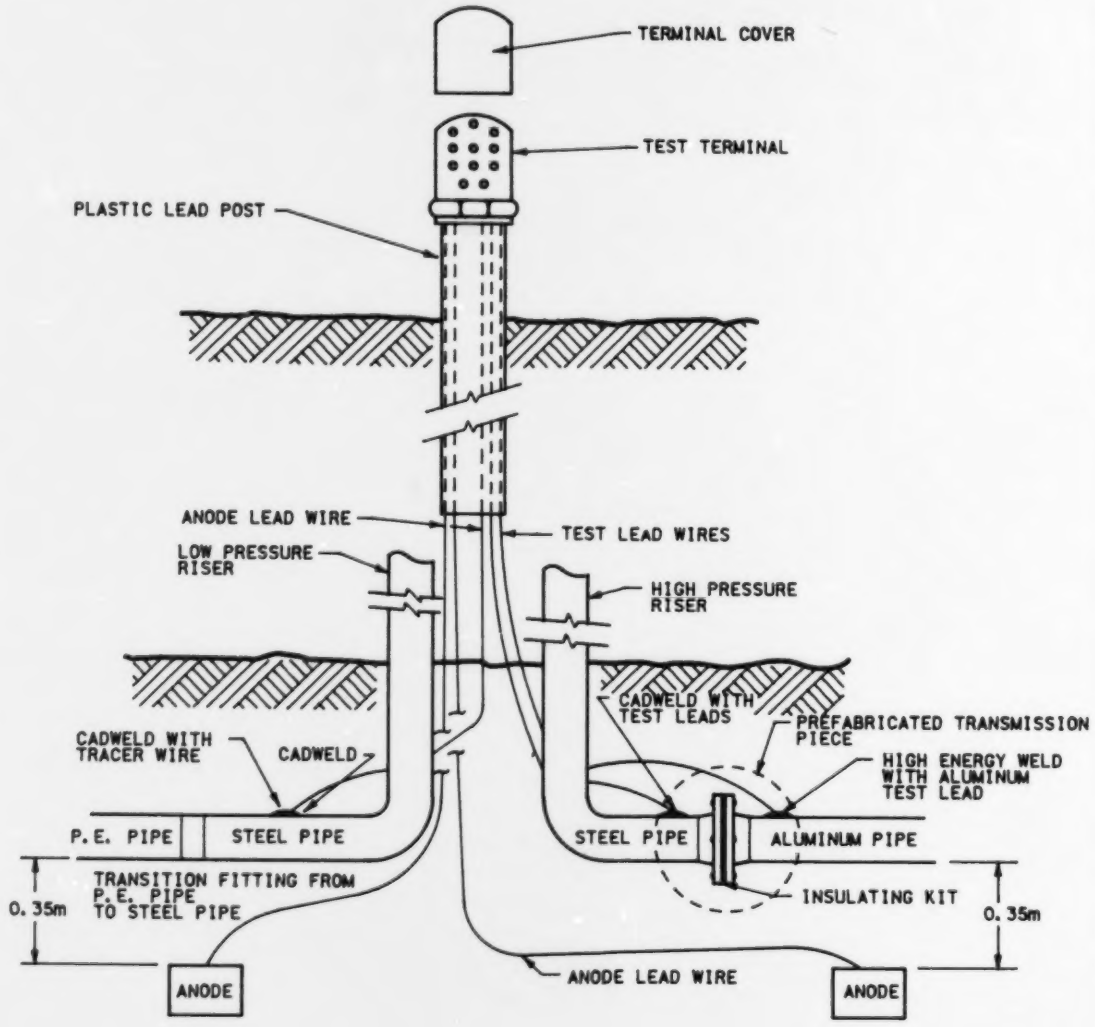
FIG. 5.11 PRIMARY SERVICE RISER DETAIL



NOTE

1. ANODE LEAD WIRE ATTACHED DIRECTLYTO RISER ON ABOVE GROUND INSTALLATIONS.
2. INSTALL ANODE MIN. 0.35m BELOWTHE PIPELINE

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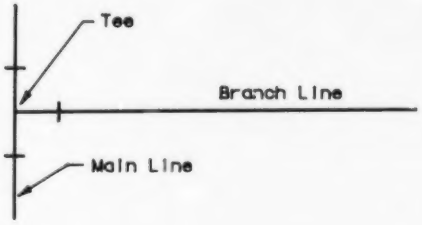
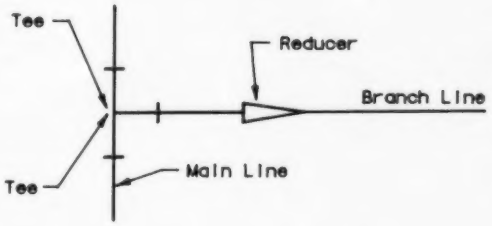
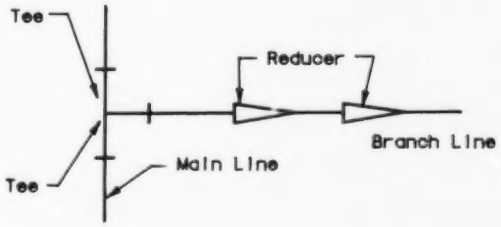
FIG. 5.12 TYPICAL ANODE INSTALLATION







NOTES
1. All dimensions are Average Outside Diameter (in mm). 2. All fittings are polyethylene and shall be joined by socket or butt fusion according to the manufacturer's recommended procedure 3. All hot lines shall be squeezed shut during connection. 4. Suitable pipe rounding support devices shall be used following the squeeze-off to ensure pipe integrity.

Main Line	Reducers			Branch Lines
26.7				26.7
33.4				33.4
33.4	33.4 x 26.7			26.7
48.3				48.3
48.3	48.3 x 33.4			33.4
48.3	48.3 x 33.4	33.4 x 26.7		26.7
60.3				60.3
60.3	60.3 x 48.3			48.3
60.3	60.3 x 33.4			33.4
60.3	60.3 x 33.4	33.4 x 26.7		26.7
73.0				73.0
73.0	73.0 x 60.3			60.3
73.0	73.0 x 48.3			48.3
73.0	73.0 x 33.4			33.4
73.0	73.0 x 60.3	60.3 x 33.4	33.4 x 26.7	26.7
88.9				88.9
88.9	88.9 x 73.0			73.0
88.9	88.9 x 60.3			60.3
88.9	88.9 x 48.3			48.3
88.9	88.9 x 33.4			33.4
88.9	88.9 x 33.4	33.4 x 26.7		26.7

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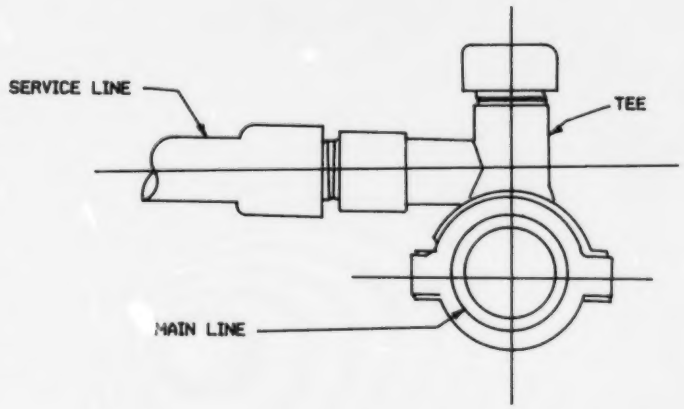
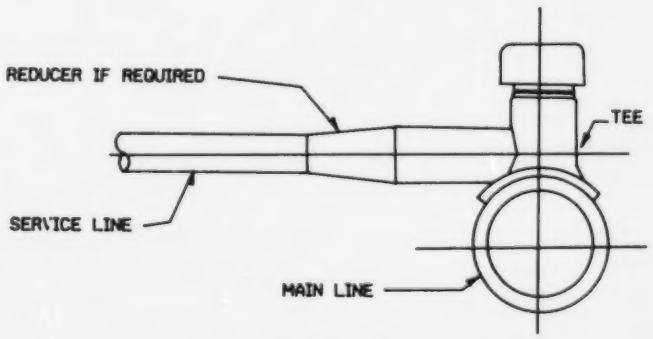
FIG. 5.13 TYPICAL POLYETHYLENE TEE JUNCTION



CLAMP ON TYPE



BUTT FUSION TYPE

NOTE:

ALL FITTINGS TO BE C.S.A. APPROVED

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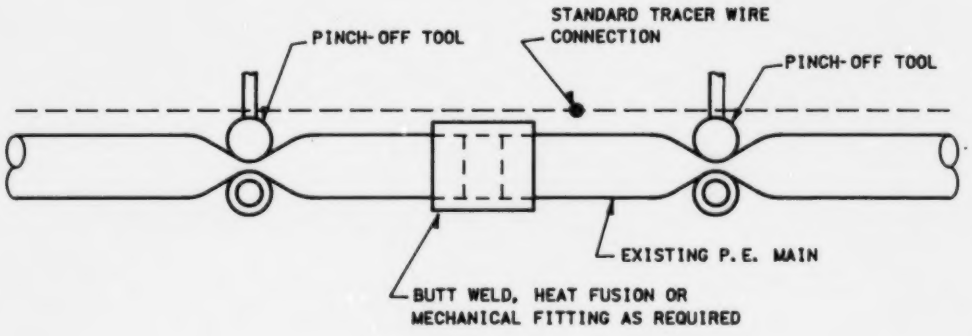
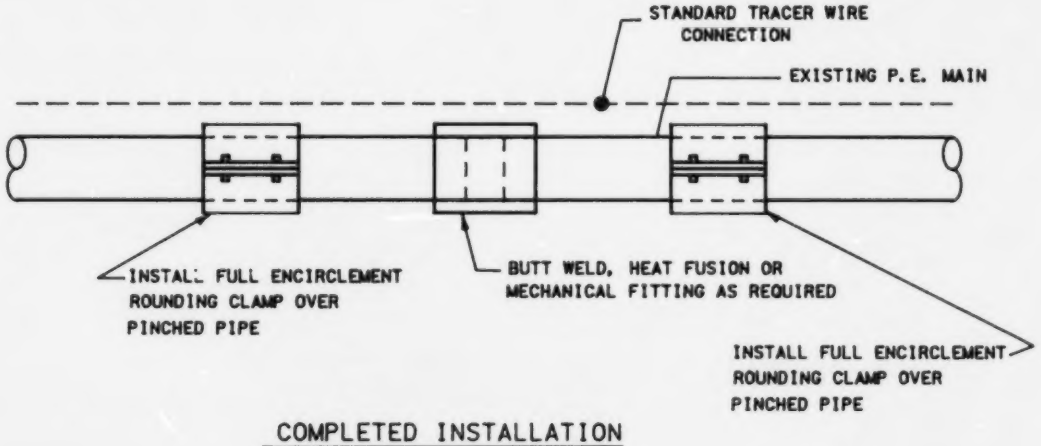
FIG. 5.14 SELF TAPPING
SADDLE TEES


PINCH-OFF TOOL
STANDARD TRACER WIRE CONNECTION
PINCH-OFF TOOL
EXISTING P.E. MAIN
BUTT WELD, HEAT FUSION OR MECHANICAL FITTING AS REQUIRED

TIE IN (SQUEEZED OFF)


STANDARD TRACER WIRE CONNECTION
EXISTING P.E. MAIN
INSTALL FULL ENCIRCLEMENT ROUNDING CLAMP OVER PINCHED PIPE
BUTT WELD, HEAT FUSION OR MECHANICAL FITTING AS REQUIRED
INSTALL FULL ENCIRCLEMENT ROUNDING CLAMP OVER PINCHED PIPE

COMPLETED INSTALLATION

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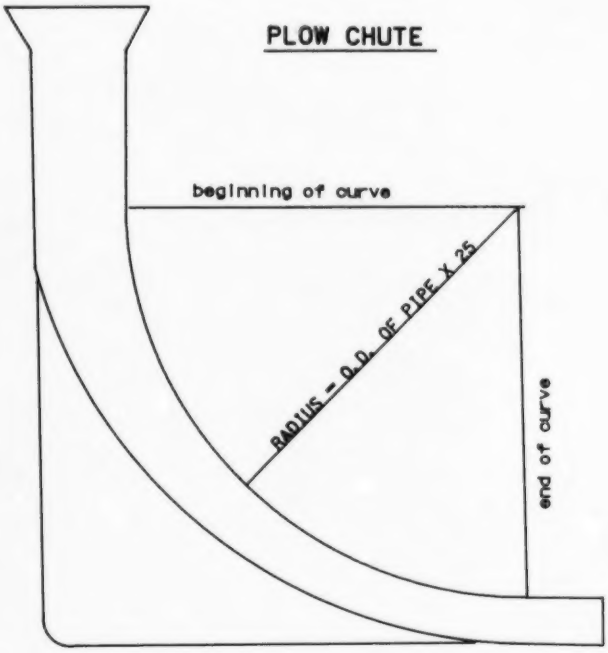
FIG. 5.15 HOT TIE-IN



PIPE SIZE	MIN. RADIUS
26.7 MM	67 CM
33.4 MM	84 CM
48.3 MM	121 CM
60.3 MM	151 CM
73.0 MM	183 CM
88.9 MM	223 CM
114.3 MM	286 CM

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FIG. 5.16- MINIMUM RADIUS OF CURVATURE FOR DIRECT BURIAL (PLOWING) OF POLYETHYLENE PIPE

PART F

AMENDMENTS AND SUPPLEMENTARY NOTES

AMENDMENTS

AMENDMENTS

AMENDMENTS

SUPPLEMENTARY NOTES